# Gases and Atmospheric Chemistry

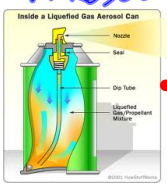
- Properties of Gases
- Gas Laws - Boyle's, Charles's Gay-Lussac's
- Gas Stoichiometry
- Air Quality

Dec 24-14:48

## Please look at the scenario below

MOLECULES
1) HEAT → GAS EXPANDING
2) HEAT → INCREASED PRESSURE

AEROSOL




+ HEAT =

- Take 1 min to silently come up with reasons why this happens
- Then share with a partner for 1 min
- Then we will have a class discussion

Jan 5-10:49

## Gases

Matter can exist in a number of different states. The most common are:

- solid
- liquid
- gas

However, matter can also exist as other states. Plasma is a fourth state of matter; it occurs at high temperatures and is ionized gas. Having been theorized since 1924 by Satyendra Nath Bose (1894-1974) and Albert Einstein (1879-1955), a fifth state of matter was confirmed in 1995. This state is called the Bose-Einstein condensate, also nicknamed superfluid, and occurs at extremely cold temperatures.

Dec 24-12:16

## Factors Determining the State of a Substance

SOLID
LIQUID
GAS

Two main factors determine the state of a substance:

Forces holding particles (ions, atoms, molecules) together
Kinetic energy of the particles (which tends to pull them apart)

If there were no forces between particles, all substances would be in gaseous form
If the forces are strong, a large amount of energy is needed to pull the particles apart.

Some examples of forces between particles are

| FORCES | STATE | EXAMPLE |
|---|---|---|
| IONIC BONDS (FORCES) | SOLID | ALUMINUM |
| DIPOLE-DIPOLE LONDON DISPERSION | LIQUID | MERCURY |
| " " | GAS | ARGON |

Dec 24-12:20

## Properties of Gases

| PROPERTIES | SOLID | LIQUID | GAS |
|---|---|---|---|
| Shape | Fixed | TAKES SHAPE OF THE CONTAINER | → |
| Volume/Heat | Definite, small change with heating | BIG CHANGE OF VOL WITH HEAT | GREATEST CHANGE IN VOL WITH HEAT |
| Compressible | Non-compressible | YES BUT ONLY SLIGHTLY | HIGHLY |
| Viscosity | HIGHEST VISCOSITY | LESS VISCOSITY | LOWEST VISCOSITY |
| Miscibility | NON-MISCIBLE (IMMISCIBLE) | Some are miscible | MISCIBLE |

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## KMT of Gases

Particles have 3 types of motion:

Vibrational — MOLECULES VIBRATE BACK AND FORTH (SOLID)

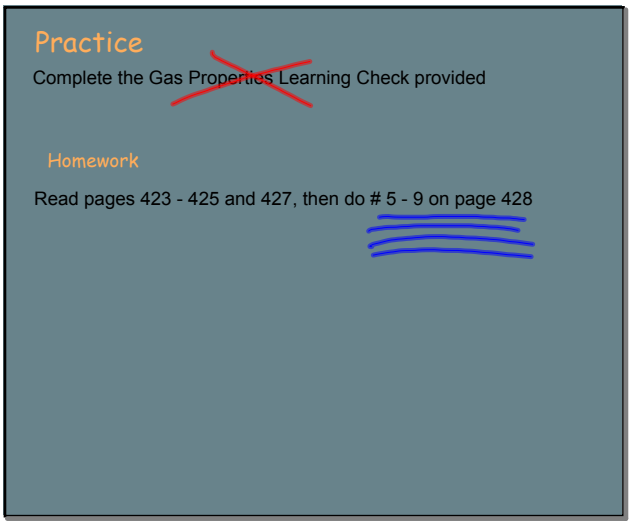
Rotational — MOLECULES ROTATE ON THEIR OWN AXIS (LIQUIDS)

Translational — MOLECULES ARE FREE TO MOVE (GAS)

Kinetic Molecular Theory of Gases is based on the following assumptions:

1) Gas particles are in constant motion. They travel in straight lines. An ideal gas has a high translational kinetic energy
2) There is empty spaces between the particles
3) The gas particles do not exert attractive or repulsive forces on each other
4) Gas particles collisions are perfectly elastic
5) If heat is added to a substance, it's particles gain energy and move faster

Dec 24-13:17


Practice
Complete the Gas Properties Learning Check provided
Homework
Read pages 423 - 425 and 427, then do # 5 - 9 on page 428

Dec 24-15:09